

WHAT IS CLAIMED IS:

1. A numerical control oscillator comprising:
 - a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and
 - a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,
 - said numerical control oscillator outputting a signal of a sampling frequency F_s ,
- 10 wherein:
 - if an upper limit of a desired frequency setting interval of an output signal is F_D and, K and L are arbitrary integers,
 - said calculator of said phase accumulator is performs one of adding and subtracting said input phase difference data and said phase data from said register by a
 - 15 modulo operation taking a nearest integer of M as a modulus, where $M = F_s/F_D \times K/L$; and
 - said phase/amplitude conversion table outputs a signal set to a frequency setting interval of a dF step, where $dF = F_D/K \times L$.
- 20 2. A digital down-converter comprising a frequency converter, the frequency converter including a numerical control oscillator as a local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency F_s , said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal, said numerical control oscillator having:
 - 25 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and
 - a memory for storing a phase/amplitude conversion table to output amplitude
 - 30 data corresponding to said phase data generated by said phase accumulator,
 - said numerical control oscillator outputting a signal of the sampling frequency F_s , wherein, if a desired frequency setting interval of said input signal is F_D and K and L are arbitrary integers, said frequency converter is adapted to frequency-convert said input

signal using a specific signal output from said local oscillator and set to a frequency setting interval of a dF step, where $dF = FD/K \times L$, said local oscillator outputting the specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M as a modulus, where $M = Fs/FD \times K/L$.

- 5 3. A digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency $Fs1$, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local
- 10 oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having:
 - a phase accumulator for accumulating input phase difference data to generate
 - 15 phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and
 - a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,
 - 20 said numerical control oscillator outputting a signal of the sampling frequency, wherein:
 - if a desired frequency setting interval of said input signal is FD and $K1$, $K2$ and $L1$ are arbitrary integers,
 - said first frequency converter is adapted to frequency-convert said input signal
 - 25 using a first specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = FD/K1 \times L1$, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = Fs1/FD \times K1/L1$; and
 - 30 said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is $Fs2$, frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = (FD \bmod FD1)/K2$, said second local oscillator outputting the second specific signal

by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = Fs2/(FD \bmod FD1) \times K2$.

4. The digital down-converter as set forth in claim 3, wherein said second
5 frequency converter is adapted to stop the frequency conversion.

5. A digital down-converter comprising a first frequency converter, the first
frequency converter including a numerical control oscillator as a first local oscillator and
serving to frequency-convert an input signal sampled at a sampling frequency $Fs1$, and a
second frequency converter, the second frequency converter including an identical
10 numerical control oscillator as the first frequency converter as a second local oscillator
and serving to secondarily frequency-convert an output signal from said first frequency
converter, said digital down-converter converting and outputting said input signal into
an output signal with a frequency lower than that of said input signal by two frequency
conversions, said numerical control oscillator having:

15 a phase accumulator for accumulating input phase difference data to generate
phase data, said phase accumulator including a register for storing and outputting said
phase data, and a calculator for one of adding and subtracting said input phase
difference data and said phase data from said register; and

20 a memory for storing a phase/amplitude conversion table to output amplitude
data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency,
wherein:

if a desired frequency setting interval of said input signal is FD , and $K1$, $K2$ and
 $L1$ are arbitrary integers,

25 said first frequency converter is adapted to frequency-convert said input signal
using a first specific signal output from said first local oscillator and set to a frequency
setting interval of an $FD1$ step, where $FD1 = FD/K1 \times L1$, said first local oscillator
outputting the first specific signal by accumulating said phase difference data by a
modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 =$
30 $Fs1/FD \times K1/L1$; and

said second frequency converter is adapted to, if a sampling frequency of the
output signal from said first frequency converter is $Fs2$, frequency-convert said output
signal from said first frequency converter using a second specific signal output from said
second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2$

= $(FD1 \bmod FD)/K2$, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = Fs2/(FD1 \bmod FD) \times K2$.

5 6. The digital down-converter as set forth in claim 5, wherein said second frequency converter is adapted to stop the frequency conversion.

7. A digital down-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal sampled at a sampling frequency $Fs1$, and a
10 second frequency converter, the second frequency converter including an identical numerical control oscillator as in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital down-converter converting and outputting said input
15 signal into an output signal with a frequency lower than that of said input signal by two frequency conversions, said numerical control oscillator having:

 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

20 a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

 said numerical control oscillator outputting a signal of the sampling frequency, wherein:

25 if a desired frequency setting interval of said input signal is FD and $K1$, $K2$ and $L1$ are arbitrary integers,

 said first frequency converter is adapted to frequency-convert said input signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = FD/K1 \times L1$, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a
30 modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = Fs1/FD \times K1/L1$; and

 said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is $Fs2$, frequency-convert said output signal from said first frequency converter using a second specific signal output from said

second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = FD/K2$, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = Fs2/FD \times K2$.

- 5 8. The digital down-converter as set forth in claim 7, wherein said second frequency converter is adapted to stop the frequency conversion.

9. A digital up-converter comprising a frequency converter, the frequency converter including a numerical control oscillator as a local oscillator and serving to frequency-convert an input signal, said digital up-converter converting said input signal
10 into a signal with a frequency higher than that of said input signal and outputting the converted signal as an output signal sampled at a sampling frequency F_s , said numerical control oscillator having:

15 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

20 a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator, said numerical control oscillator outputting a signal of the sampling frequency F_s ,

25 wherein, if a desired frequency setting interval of said output signal is FD and K and L are arbitrary integers, said frequency converter is adapted to frequency-convert said input signal using a specific signal output from said local oscillator and set to a frequency setting interval of a dF step, where $dF = FD/K \times L$, said local oscillator outputting the specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M as a modulus, where $M = Fs/FD \times K/L$.

10. A digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal, and a second frequency converter, the
30 second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said

digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency F_{s2} , said numerical control oscillator having:

- 5 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and
- a memory for storing a phase/amplitude conversion table to output amplitude
- 10 data corresponding to said phase data generated by said phase accumulator,
- said numerical control oscillator outputting a signal of the sampling frequency,
- wherein:
- if a desired frequency setting interval of said output signal is FD , and $K1$, $K2$, and $L2$ are arbitrary integers,
- 15 said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer
- 20 of $M2$ as a modulus, where $M2 = F_{s2}/FD \times K2/L2$; and
- said first frequency converter is adapted to, if a sampling frequency of said input signal is F_{s1} , frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = (FD \bmod FD2)/K1$, said first local oscillator outputting the second specific
- 25 signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = F_{s1}/(FD \bmod FD2) \times K1$.

11. The digital up-converter as set forth in claim 10, wherein said first frequency converter is adapted to stop the frequency conversion.

- 30 12. A digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first frequency converter as a second local oscillator and serving to

secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency F_{s2} , said numerical control oscillator having:

a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

if a desired frequency setting interval of said output signal is FD and $K1$, $K2$ and $L2$ are arbitrary integers,

said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = F_{s2}/FD \times K2/L2$; and

said first frequency converter is adapted to, if a sampling frequency of said input signal is F_{s1} , frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = (FD2 \bmod FD)/K1$, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = F_{s1}/(FD2 \bmod FD) \times K1$.

13. The digital up-converter as set forth in claim 12, wherein said first frequency converter is adapted to stop the frequency conversion.

14. A digital up-converter comprising a first frequency converter, the first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert an input signal, and a second frequency converter, the second frequency converter including an identical numerical control oscillator as

included in the first frequency converter as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said digital up-converter performing two frequency conversions to convert said input signal into a signal with a frequency higher than that of said input signal and output the converted signal as an output signal sampled at a sampling frequency F_{s2} , said numerical control oscillator having:

5 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

10 a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

15 if a desired frequency setting interval of said output signal is FD and $K1$, $K2$ and $L2$ are arbitrary integers,

said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = F_{s2}/FD \times K2/L2$; and

20 said first frequency converter is adapted to, if a sampling frequency of said input signal is F_{s1} , frequency-convert said input signal using a second specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = FD/K1$, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = F_{s1}/FD \times K1$.

30 15. The digital up-converter as set forth in claim 14, wherein said first frequency converter is adapted to stop the frequency conversion.

16. A receiver comprising a first frequency converter, the first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a

sampling frequency F_s and a phase locked loop (PLL) circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, a second frequency converter, the second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having:

a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

if a desired frequency setting interval of said received signal is FD and K_1 , K_2 and L_1 are arbitrary integers,

said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K_1 \times L_1$, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M_1 as a modulus, where $M_1 = F_s/FD \times K_1/L_1 \times P$; and

said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is F_{s1} , frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an FD_2 step, where $FD_2 = (FD \bmod FDP)/K_2$, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M_2 as a modulus, where $M_2 = F_{s1}/(FD \bmod FDP) \times K_2$.

17. The receiver as set forth in claim 16, wherein said second frequency converter is adapted to stop the frequency conversion.

18. A receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency F_s and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having:

a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

if a desired frequency setting interval of said received signal is FD , and $K1$, $K2$, and $L1$ are arbitrary integers,

said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K1 \times L1$, said first local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = F_s/FD \times K1/L1 \times P$; and

said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is F_{s1} , frequency-convert said output signal from said first frequency converter using a second specific signal output from said

second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = (FDP \bmod FD)/K2$, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = Fs1/(FDP \bmod FD) \times K2$.

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19. The receiver as set forth in claim 18, wherein said second frequency converter is adapted to stop the frequency conversion.

20. A receiver comprising a first frequency converter including a first local oscillator and serving to frequency-convert a received signal, said first local oscillator including a numerical control oscillator operating at a sampling frequency F_s and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, a second frequency converter including an identical numerical control oscillator as included in the first local oscillator as a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, and a demodulator for demodulating an output signal from said second frequency converter to extract received data therefrom, said receiver converting said received signal into a baseband received signal with a frequency lower than that of said received signal by two frequency conversions and extracting the received data from the converted baseband received signal, said numerical control oscillator having:

a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

25 a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

30 if a desired frequency setting interval of said received signal is FD , and $K1$, $K2$, and $L1$ are arbitrary integers,

said first frequency converter is adapted to frequency-convert said received signal using a first specific signal output from said first local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K1 \times L1$, said first local oscillator outputting the first specific signal by accumulating said phase difference data

by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = F_s / FD \times K1 / L1 \times P$; and

said second frequency converter is adapted to, if a sampling frequency of the output signal from said first frequency converter is F_{s1} , frequency-convert said output signal from said first frequency converter using a second specific signal output from said second local oscillator and set to a frequency setting interval of an $FD2$ step, where $FD2 = FD / K2$, said second local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = F_{s1} / FD \times K2$.

21. The receiver as set forth in claim 20, wherein said second frequency converter is adapted to stop the frequency conversion.

22. A transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert the output signal from said modulator, a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency F_s and a PLL circuit having a multiplication ratio P (P is an integer) and acting to receive the output signal from the numerical control oscillator as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having:

a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

if a desired frequency setting interval of said transmit signal is FD , and $K1$, $K2$, and $L2$ are arbitrary integers,

said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by
 5 accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where $M2 = Fs/FD \times K2/L2 \times P$; and

said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is $Fs1$, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to
 10 a frequency setting interval of an FD1 step, where $FD1 = (FD \bmod FDP)/K1$, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where $M1 = Fs1/(FD \bmod FDP) \times K1$.

15 23. The transmitter as set forth in claim 22, wherein said first frequency converter is adapted to stop the frequency conversion.

24. A transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert
 20 the output signal from said modulator, a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P (P is an integer) and
 25 acting to receive the output signal from the numerical control oscillator as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, said numerical control oscillator having:

30 a phase accumulator for accumulating input phase difference data to generate phase data, said phase accumulator including a register for storing and outputting said phase data, and a calculator for one of adding and subtracting said input phase difference data and said phase data from said register; and

a memory for storing a phase/amplitude conversion table to output amplitude data corresponding to said phase data generated by said phase accumulator,

said numerical control oscillator outputting a signal of the sampling frequency, wherein:

if a desired frequency setting interval of said transmit signal is FD , and $K1$, $K2$, and $L2$ are arbitrary integers,

5 said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M2$ as a modulus, where $M2 = Fs/FD \times K2/L2 \times P$; and

10 said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is $Fs1$, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to a frequency setting interval of an $FD1$ step, where $FD1 = (FDP \bmod FD)/K1$, said first
15 local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of $M1$ as a modulus, where $M1 = Fs1/(FDP \bmod FD) \times K1$.

25. The transmitter as set forth in claim 24, wherein said first frequency
20 converter is adapted to stop the frequency conversion.

26. A transmitter comprising a modulator for modulating and outputting a baseband transmit signal based on transmit data, a first frequency converter including a numerical control oscillator as a first local oscillator and serving to frequency-convert
25 the output signal from said modulator, a second frequency converter including a second local oscillator and serving to secondarily frequency-convert an output signal from said first frequency converter, said second local oscillator including an identical numerical control oscillator as included in the first frequency converter operating at a sampling frequency Fs and a PLL circuit having a multiplication ratio P , where P is an integer, and
30 acting to receive the output signal from the numerical control oscillator of claim 1 as a reference signal, said transmitter converting and outputting said baseband transmit signal into a transmit signal with a frequency higher than that of said baseband transmit signal by two frequency conversions, wherein:

35 if a desired frequency setting interval of said transmit signal is FD , and $K1$, $K2$, and $L2$ are arbitrary integers,

said second frequency converter is adapted to frequency-convert the output signal from said first frequency converter using a first specific signal output from said second local oscillator and set to a frequency setting interval of an FDP step, where $FDP = FD/K2 \times L2$, said second local oscillator outputting the first specific signal by
 5 accumulating said phase difference data by a modulo operation taking a nearest integer of M2 as a modulus, where $M2 = Fs/FD \times K2/L2 \times P$; and

said first frequency converter is adapted to, if a sampling frequency of the output signal from said modulator is $Fs1$, frequency-convert said output signal from said modulator using a second specific signal output from said first local oscillator and set to
 10 a frequency setting interval of an FD1 step, where $FD1 = FD/K1$, said first local oscillator outputting the second specific signal by accumulating said phase difference data by a modulo operation taking a nearest integer of M1 as a modulus, where $M1 = Fs1/FD \times K1$.

27. The transmitter as set forth in claim 26, wherein said first frequency
 15 converter is adapted to stop the frequency conversion.